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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SOOVO SEN, MARK J. SEAMONS, PRIYA KULKARNI, VISWESWAREN SIVARAMAKRISHNAN, SUDHA RATHI, TSUTOMU SHIMAYAMA, THOMAS NOWAK, and WENDY H. YEH

Appeal 2008-1901
Application 10/757,021
Technology Center 1700

Decided: July 31, 2008

Before CHUNG K. PAK, LINDA M. GAUDETTE, and MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1 through 5 and 8 through 22, all of the pending claims in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM.

STATEMENT OF THE CASE

The subject matter on appeal is directed to liners configured to be placed in an interior vacuum chamber of a semiconductor substrate processing system to reduce contamination of areas in the chamber, which are difficult to effectively clean (Spec. 1-6 and 11-12). These liners would minimize the number of interruptions (production stoppage) associated with periodic disassembling and scrubbing (cleaning) of the chamber parts, which represent "an obstacle to throughput and profitability of the semiconductor fabrication process" (Spec. 5). Further details of the appealed subject matter are recited in representative claims 1 and 5 reproduced below:

> 1. A process kit for a vacuum processing chamber, the vacuum processing chamber comprising a chamber body defining an interior processing region, the process kit comprising:
>
> a pumping liner configured to be placed within the processing region of the processing chamber, the pumping liner comprising a circumferential body having an upper surface and a lower surface, wherein the body has a plurality of pumping holes disposed along the body;
>
> a C-channel liner configured to be placed along an outer diameter of the pumping line, the C-channel liner comprising:
>
> a circumferential body portion having an upper surface and lower surface,
>
> a circumferential upper arm disposed proximate the upper surface of the body portion of the C-channel liner,
>
> a lower arm disposed around a selected radial portion of the body portion of the C-channel liner, the lower arm disposed along the bottom surface of the body portion of the C-channel liner, and

a channel portion in the C-channel liner defined between the body portion of the C-channel liner, the upper arm, the lower arm, and an outer diameter of the pumping liner, wherein the C-channel liner has a pumping port liner opening;

a middle liner configured to reside below the pumping liner and the C-channel liner; and

a lower liner configured to reside below the middle liner;

wherein an upper interlocking feature is formed between the upper surface of the pumping liner and the upper arm of the C-channel liner,

wherein a lower interlocking feature is formed between the lower surface of the pumping liner and the lower arm of the C-channel liner; and

wherein the upper and lower interlocking features inhibit parasitic pumping within the processing region.

5. A process kit for a vacuum processing chamber, the vacuum processing chamber comprising a chamber body defining an interior processing region, the process kit comprising:

a pumping liner configured to be placed within the processing region of the processing chamber, the pumping liner comprising:

a circumferential body, wherein the circumferential body has a plurality of pumping holes disposed along the circumferential body,

a shoulder circumferentially placed along an upper surface of the pumping liner body, and

a lower lip disposed along a radial portion of a lower surface of the pumping line body;

a C-channel liner configured to be placed along an outer diameter of the pumping liner body within the processing region of the processing chamber, the C-channel liner comprising:

a circumferential body,

an upper arm,

a lower arm,

a channel portion defined by the upper arm, the lower arm, the body of the C-channel liner, and the body of the pumping liner,

an upper lip circumferentially disposed along the upper arm, the upper lip of the C-channel liner configured to interlock with the shoulder of the pumping line body, and

a lower shoulder along a radial portion of the lower arm, the lower shoulder of the C-channel liner configured to interlock with the lower lip of the pumping liner and to also provide a pumping port liner opening;

a middle liner configured to reside below the pumping liner and C-channel liner; and

a lower liner configured to reside below the middle liner.

As evidence of unpatentability of the appealed subject matter, the Examiner has proffered the following prior art references:

Fairbairn	US 5,911,834	Jun. 15, 1999
Frijlink	WO 01/46498 A3	Jun. 28, 2001
Sajoto	US 6,527,865 B1	Mar. 4, 2003
Sillmon	US 6,666,920 B1	Dec. 23, 2003

The Examiner has rejected the claims on appeal based on the above proffered evidence as follows:

1) Claims 1 through 5, 8 through 10, and 16 through 18 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Sajoto and Frijlink;

2) Claims 11, 12, 20, and 21 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Sajoto, Frijlink, and Sillmon;

3) Claims 13 through 15 and 19 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Sajoto, Frijlink, and Fairbairn; and

4) Claim 22 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Sajoto, Frijlink, Fairbairn, and Sillmon.

Appellants appeal from the Examiner's decision rejecting the claims on appeal under 35 U.S.C. § 103(a). [1]

ISSUE

The dispositive question is: Have Appellants shown reversible error in the Examiner's determination that one of ordinary skill in the art would have been led to employ Frijlink's gas collector corresponding to the claimed pumping and C-channel liners for exhausting gas in the interior

[1] Appellants only argue the limitations set forth in claims 1 and 5 (App. Br. 12-18 and Reply Br. 1-4). Appellants have not presented substantive arguments for patentability of the other individual claims on appeal with reasonable specificity (*id*). Therefore, for purposes of this appeal, we select claims 1, 5, 11, 13, and 22 representative of the claims rejected under different grounds of rejection and decide the propriety of these grounds of rejection based on these representative claims consistent with 37 C.F.R. § 41.37(c)(1)(vii) (2005).

processing region of the vacuum processing chamber of Sajoto's chemical vapor deposition apparatus within the meaning of 35 U.S.C. § 103(a)?

RELEVANT FACTUAL FINDINGS (FF)

1. Sajoto teaches a chemical vapor deposition system having a vacuum chamber body 12 defining an interior processing region 20 having a substrate support member 24, which is in fluid communication with an exhaust/pumping system 18 (Figs. 1 and 2, col. 4, l. 25 to col. 5, l. 33, and col. ll. 9-12).
2. Sajoto teaches employing "removable deposition chamber liners (which can be used at a number of different locations) [to] facilitate periodic cleaning of the deposition chamber. A liner in accordance with a preferred embodiment of the invention includes an integral or functionally integral (i.e., assembled from one or more components as attached or overlapping units) generally chamber liner 28 that covers upper chamber surfaces adjacent the substrate support member 24 and a bottom liner 21 covers the lower chamber wall surfaces below substrate support member" (Fig. 2 and col. 8, ll. 45-54).
3. Sajoto teaches employing a removable heated liner 112 having a body 124 defining a gas channel 110, which is in fluid communication with interior processing region 20 covered with the chamber liner 28 via a manifold (Figs. 1, 2, 4, and 11, and col. 12, ll. 21-40).
4. Sajoto teaches that the removable liner 112 can be shaped and sized to fit within the housing 108 of the exhaust/pumping system 18 (Figs. 4, and 11, and col. 12, ll. 32-35).

5, Sajoto does not specifically mention a gas exhaust means defined by a circumferential C-channel liner which can be interlocked with another circumferentially shaped liner having a plurality of pumping holes (pumping liner) to form a gas exhaust channel with the holes for passing by-product gas from the interior processing region into the gas exhaust channel for the gas removal purpose.

6. Frijlink teaches employing a gas collector configured to be placed within the processing region of a chemical vapor deposition chamber, in lieu of a conventional gas exhaust arrangement (e.g., a gas manifold type), to improve efficiency, uniform deposition of layers on semiconductor wafers, chamber cleaning, counter-flow gas volume usage, and pressure maintenance (p. 1, ll. 1-30, and p. 4, ll. 1-5).

7. Frijlink teaches that this gas collector, for example, minimizes reactive gas contamination or deposition on areas in the processing region of the chemical vapor deposition chamber and allows the gas mixture to which the wafers are exposed be changed quickly as may be required (p. 1, l. 33 to p. 2, l. 24).

8. Frijlink describes its gas collector as having a C-shape liner having a circumferential body 17, a circumferential upper arm 15 disposed proximate the upper surface of the circumferential body 17, and a circumferential lower arm 14 disposed along the bottom surface of the circumferential body 17 to define a gas exhaust channel 16, which is configured to interlock with another liner corresponding to the claimed pumping liner, having a circumferential body 18 having a plurality of pumping holes 12 for

removing reactive gas from the interior processing region of the chamber to the gas exhaust channel 16 (Figs. 4, 5A and 5B and p. 5, ll. 16-32).

9. Sillmon "teaches sealing the interface of a C-channel liner and a pumping plate" (*compare* Ans. 6 *with* App. Br. 12-18 and Reply Br. 1-4).

10. Fairbairn "teaches a processing apparatus that includes a pair of processing regions 106 connected by a polished aluminum pressure equalization port liner 621 (Figures 19 and 21)" (*compare* Ans. 7 *with* App. Br. 12-18 and Reply Br. 1-4).

PRINCIPLES OF LAW

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations, if any. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). It is important to note that "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). "[A]nalysis [of whether the subject matter of a claim would have been suggested] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l Co., v. Teleflex, Inc.*, 127 S. Ct. 1727, 1740-41 (2007); *see also*

DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co., 464 F.3d 1356, 1361 (Fed. Cir. 2006).

For instance, "when a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. at 1740 (*quoting Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976)). Appellants' mere arguments in the Brief or conclusory statements in the Specification unsupported by objective evidence are not sufficient to show that the old elements would not perform their known or expected functions. *See, e.g., In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Lindner*, 457 F.2d 506, 508 (CCPA 1972).

ANALYSIS

Appellants do not dispute that Sajoto teaches a chemical vapor deposition reactor having a vacuum chamber body defining an interior processing region having a substrate support member , which is connected to an exhaust/pumping system (compare Ans. 4 with App. Br. 12-18 and Reply Br. 1-4 and FF 1). Nor do Appellants dispute that Frijlink teaches a process kit (an exhaust gas collector) corresponding to the claimed C-channel and pumping liners that can be placed within an interior processing region of the vacuum chamber body of a chemical vapor deposition reactor (*compare* Ans. 5-6 *with* App. Br. 12-18 and Reply Br. 1-4 and FF 6-8). Appellants' only contention in each of the Examiner's four grounds of rejection is that one of ordinary skill in the art would not have been led to employ the exhaust gas collector taught by Frijlink (corresponding to the claimed C-

channel and pumping liners) in the interior processing region defined by the vacuum chamber body of Sajoto's chemical vapor deposition reactor within the meaning of 35 U.S.C. § 103 (App. Br. 12-18 and Reply Br. 1-4).

Thus, as noted above, the dispositive question is: Have Appellants shown reversible error in the Examiner's determination that one of ordinary skill in the art would have been led to employ Frijlink's exhaust gas collector corresponding to the claimed pumping and C-channel liners for exhausting by-product gas in the interior processing region defined by the vacuum chamber body of Sajoto's chemical vapor deposition apparatus within the meaning of 35 U.S.C. § 103(a)? On this record, we answer this question in the negative.

As indicated *supra*, Sajoto exemplifies employing "chamber liner 28 that covers upper chamber surfaces adjacent the substrate support member 24 and a bottom liner 21 [corresponding to the claimed lower liner] covers the lower chamber wall surfaces below substrate support member..." (FF 1-2). Sajoto also teaches that the chamber liner 28 can be made of two components (the claimed middle liner and an upper liner corresponding to the claimed pumping liner) (*Id.*). Sajoto further teaches that removable liners can be used in various locations of the interior processing region, including a gas exhaust area, to facilitate periodic cleaning of the deposition chamber and the gas exhaust area (FF 2-4).

Although, Sajoto does not expressly mention employing the claimed C-channel and pumping liners for removing by-product gas from the interior processing region of a chemical vapor deposition reactor, Frijlink teaches employing a gas collector (corresponding to the claimed C-channel and

pumping liners) useful for exhausting by-product reactive gas in the interior process region of a chemical vapor deposition reactor (FF 5-8). Frijlink teaches to utilize its gas collector, in lieu of conventional gas exhausting arrangements, for the purpose of, for example, minimizing or preventing reactive gas contamination or deposition on areas of the interior processing region of the chemical vapor deposition reactor and allowing the gas mixture to which the wafers are exposed be changed quickly as may be required (FF 6-8).

Given the above teachings, we concur with the Examiner that one of ordinary skill in the art would have been led to employ the gas collector (corresponding to the claimed C-channel and pumping liners) taught by Frijlink, in lieu of the conventional gas exhausting (manifold) arrangement employed in the upper area[2] of the interior processing region of Sajoto's chemical vapor deposition reactor, motivated by a reasonable expectation of successfully obtaining the advantages taught by Sajoto and Frijlink.

In reaching this determination, we note Appellants' allegation of Sajoto's chemical vapor deposition reactor either having or not having problems relating to disruption in pumping gas or a pressure gradient change and by-product deposition (App. Br. 12-13 and Reply Br. 1-4). However, we find no evidence to support this allegation (*id.*). From our perspective, Appellants' mere arguments in the Brief cannot take the place of objective evidence.

In any event, as indicated *supra*, Frijlink teaches employing its gas collector to obtain various advantages, in addition to minimizing, for

[2] The upper component of the one or two part chamber liner taught by Sajoto.

example, the pressure gradient and by-product gas deposition problems, in a chemical vapor deposition reactor, such as that taught by Sajoto. It follows that one of ordinary skill in the art would have reasonably expected from the collective teachings of Sajoto and Frijlink that the additional advantages not obtainable from those taught by Sajoto could be obtained via employing Frijlink's gas collector. Moreover, one of ordinary skill in the art would have been motivated to employ Fijlink's gas collector in the upper region of the interior processing region (in lieu of conventional gas exhaust arrangement present therein) of Sajoto's chemical vapor deposition reactor in an optimum manner so that any disruption in pumping by-product gases in the interior processing region of Sajoto's chemical vapor deposition reactor to the gas exhaust channel could be avoided or minimized.

Accordingly, based on the totality of record relied upon by the Examiner and Appellants, including due consideration of Appellants' arguments in the Appeal and Reply Briefs, we determine that the preponderance of evidence weighs most heavily in favor of obviousness of the subject matter recited in the claims on appeal within the meaning of 35 U.S.C. § 103.

ORDER

The decision of the Examiner is affirmed.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

PL Initial:
sld

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